DECLARATION OF MARK J.S. HEATH, M.D.

I, Mark J.S. Heath, make the following declaration under 28 U.S.C. §1746:

A. INTRODUCTION AND QUALIFICATIONS

1. My name is Mark J.S. Heath, M.D. I am over eighteen years old and am competent to give sworn testimony in a court of law.

2. I am an Assistant Professor of Clinical Anesthesiology at Columbia University in New York City. I received my Medical Doctorate degree from the University of North Carolina at Chapel Hill in 1986, and completed residency and fellowship training in Anesthesiology in 1992 at Columbia University. I am Board Certified in Anesthesiology, and am licensed to practice medicine in New York State. My work consists of approximately equal parts of performing clinical anesthesiology (specializing in cardiothoracic anesthesiology), teaching residents, fellows, and medical students, and researching the practice of execution by lethal injection in the United States.

3. As a result of my training and research, I am familiar with and proficient in the use and pharmacology of the chemicals used to perform lethal injection executions. I am qualified to do animal research at Columbia University and am familiar with the American Veterinary Medical Association's guidelines for animal research and animal euthanasia.

4. Over the past several years, as a result of concerns about the mechanics of lethal injection as practiced in the United States, I have performed many hundreds of hours of research into the techniques that are used during this procedure. The following table reflects those states where I have testified as an expert medical witness regarding lethal injection in court, those states where I have testified as an expert medical witness regarding lethal injection by affidavit or declaration, and those states where I have been deposed as an expert medical witness regarding lethal injection under oath.

Court Testimony	Affidavit or Declaration	Deposition
AL, CA, DE, FL, GA, ID, IN, KY, LA, MD, MO, NC, NV, OH, OK, TN, VA	AL, AZ, AR, CA, CO, CT, DE, FL, GA, ID, IN, KY, LA, MD, MO, MS, MT, NC, NE, NV, NY, OH, OK, SC, SD, TN, TX, VA, WA, Federal	AL, CA, DE, MT, SD

5. I have reviewed the execution protocols, statutes authorizing executions, and autopsy data (when available) from each of the above referenced states and the federal government.

6. As a result of the discovery process in other litigation, I have participated in inspections of the execution facilities in Arizona, Maryland, Missouri, California, Delaware, North Carolina, Texas, Alabama, Connecticut, and the Federal Execution Facility in Terre Haute, Indiana. During court proceedings, I have heard testimony from prison wardens who are responsible for conducting executions by lethal injection.

7. I have testified before the Nebraska Senate Judiciary Committee regarding proposed legislation to adopt lethal injection. I have testified before the Pennsylvania Senate

Judiciary Committee regarding proposed legislation to prohibit the use of pancuronium bromide or other neuromuscular blockers in Pennsylvania's lethal injection protocol. I have testified before the Maryland House and Senate Judiciary Committees regarding legislation on the administrative procedures that govern the creation of lethal injection protocols. I have testified before the South Dakota House Committee on State Affairs regarding proposed legislation to amend the lethal injection statute. I have testified before the Florida Governor's Commission on Administration of Lethal Injection as part of the Commission's review of the method in which lethal injection protocols are administered by the Florida Department of Corrections. I have testified before the House of Lords in the United Kingdom regarding the use of medical drugs in executions by lethal injection.

8. My research regarding lethal injection has involved extensive conversations with recognized experts in the fields of anesthesiology, toxicology, and forensic pathology, and correspondence with Drs. Jay Chapman and Stanley Deutsch, the physicians responsible for introducing lethal injection as a method of execution in Oklahoma.

9. My qualifications are further detailed in my curriculum vitae, a copy of which is attached hereto and incorporated herein by reference.

B. SUMMARY OF OPINIONS

10. I hold all opinions expressed in this declaration to a reasonable degree of medical certainty unless otherwise specifically noted.

11. I have given declarations in two previous federal civil actions in Mississippi: (1) in *Berry et al. v. Epps*, 4:07-cv-00176-WAP-DAS; and (2) in *Thorson v. Epps*, 4:08-cv-00129-WAP-JMV. The study and analysis I made of Mississippi's system for lethal injection executions for the *Berry* and *Thorson* cases formed the foundation of my work in this case. I do not recant the facts, conclusions, and opinions given in the *Berry* and *Thorson* cases; indeed, later events in other states have demonstrated the accuracy of my opinions in these prior Mississippi cases. I will not, however, repeat the facts, conclusions, and opinions made in those declarations, except where necessary to make a clear presentation of my opinions in this case.

12. In addition to the materials I reviewed in the *Berry* and *Thorson* cases, I have reviewed the following documents:

- Prior Declarations, Reports, and Affidavits of Mark Heath from the *Berry* and *Thorson* cases, including 2007-10-23 Declaration from *Berry*, 2008-06-24 Affidavit from *Berry*, 2010-05-16 Declaration from *Thorson*, and 2010-05-23 Report from *Thorson*
- Ty Alper, *Anesthetizing the Public Conscience: Lethal Injection and Animal Euthanasia*, 35 Fordham Urb. L. J. 817 (2008)
- 2008-07-01 Mississippi Veterinary Practice Act
- 2013-10-28 Request for Public Records by the Mississippi Office of Capital Post-Conviction Counsel to Mississippi Department of Corrections (MDOC) and Responsive Records from MDOC

- 2014-02-07 Request for Public Records by the Roderick & Solange MacArthur Justice Center to MDOC and Responsive Records from MDOC
- 2014-02-12 The Mississippi Board of Veterinary Medicine Rules
- 2014-03-20 Affidavit of Jim Norris, Special Assistant Attorney General for the State of Mississippi assigned to the MDOC, with Exhibits
- 2014-03-28 Complaint for Equitable and Injunctive Relief, Michelle Byrom and Charles Crawford v. Epps et al., 25CH1:14-cv-000424
- 2014-05-08 Professional Compounding Centers of America, Inc.'s Objections to Plaintiff's Subpoena, Michelle Byrom and Charles Crawford v. Epps et al., 25CH1:14-cv-000424
- 2014-05-13 Brister Brothers Response to Plaintiff's Subpoena, Michelle Byrom and Charles Crawford v. Epps et al., 25CH1:14-cv-000424
- 2014-07-01 Mississippi Board of Pharmacy Regulations
- 2014-12-11 MDOC Records Provided in Response to 2014-11-20 Request for Public Records by the Roderick & Solange MacArthur Justice Center
- 2015-02-20 Request for Public Records by the Roderick & Solange MacArthur Justice Center to MDOC and Responsive Records from MDOC
- 2015-04-15 Affidavit of Dr. Jason Zastre, State of Georgia, County of Clarke
- Excerpts from Brister Brothers Facebook Website
- Records of MDOC Purchases from Brister Brothers in Fiscal Years 2012, 2013, and 2014 as Available on Transparency.ms.gov, filed as Document no. 11-1, The Roderick & Solange MacArthur Justice Center and Michelle Byrom v. Mississippi Department of Corrections, 25CH1:14-cv-000261.
- Miss. Code Ann. § 99-19-51, Method of Execution
- Execution Chronology Records for Mississippi Executions from 2002 to 2010

13. Mississippi statutory law (section 99-19-51 of the Mississippi Code) requires that executions be carried out "by continuous intravenous administration of a lethal quantity of an ultra short-acting barbiturate or other similar drug in combination with a chemical paralytic agent."

14. When I evaluated the protocol for executions by lethal injection in the *Berry* and *Thorson* cases, I explained that the Mississippi Department of Corrections (MDOC) used the three-drug series for lethal injection which was first proposed by Drs. Chapman and Deutsch in Oklahoma: (1) The administration of general anesthesia. (2) The administration of a neuromuscular blocking agent that has a paralyzing effect to ensure the execution appears serene and peaceful. (3) The administration of potassium chloride, which kills the prisoner by stopping his heart.

15. From a review of the documents set forth in paragraph 12 above, the MDOC plans to continue the use of the three-drug series in future executions.

16. Two significant changes have occurred since I gave my most recent declaration in the *Thorson* case. First, in the last few years, the majority of executing states have abandoned the second and third drugs in the original three-drug protocol, instead executing prisoners by a single overwhelming dose of a barbiturate. This includes Kentucky, the state which was involved in the *Baze* case in the United States Supreme Court. In the *Thorson* case, MDOC defended its three-drug protocol by comparing it favorably to the Kentucky protocol approved in *Baze*. That comparison is no longer true. More importantly, the states which have adopted a single-drug anesthetic-only barbiturate technique have done so to reduce the substantial risk of serious harm and severe pain presented by the use of a paralytic agent and potassium chloride in a three-drug series. At least eighty (80) executions nationwide have been accomplished with a single-drug barbiturate-only protocol.

17. The second significant change is that, in June 2012, MDOC made a significant change in its planned procedure for lethal injection when it purchased the Active Pharmaceutical Ingredients ("API") used for compounding pentobarbital. MDOC has chosen to keep the source or manufacturer of these APIs a secret. Previously, Mississippi used FDA-approved[1] medications, either Pentothal (the trademarked name for sodium thiopental) or pentobarbital (brand name Nembutal), as the first drug in its three-drug execution series.[2]

18. It is my opinion, to a reasonable degree of medical certainty, that Mississippi's planned use of compounded pentobarbital as the first drug in a three-drug series, which is completed with the continuous intravenous administration of a chemical paralytic agent and potassium chloride, creates a substantial risk of serious harm and severe pain to the condemned prisoner. The single-drug anesthetic-only lethal injection protocol, which is now used in the most executions, completely eliminates the risks of severe pain and suffering posed by the use of a paralytic agent and potassium chloride.

19. It is further my opinion, to a reasonable degree of medical certainty, that a drug compounded from the API for pentobarbital is not an "ultra short-acting barbiturate or other similar drug" as required in Mississippi Code Section 99-19-51.

C. THE CHANGE TO THE SINGLE-DRUG ANESTHETIC-ONLY BARBITURATE TECHNIQUE IN OTHER STATES

20. The first of the two significant changes impacting lethal injection in Mississippi is that the majority of executing states, and the majority of executions, have abandoned the use of paralytic drugs. Of the 7 states that conducted executions in 2014, only 2 (Florida and Oklahoma)

[1] In this declaration, I will use the term "FDA-approved medication" or "FDA-approved barbiturate" to refer to a barbiturate manufactured under FDA-controlled and regulated conditions. A drug which is compounded is not considered an "FDA-approved medication." FDA, The Special Risks of Pharmacy Compounding (2012), available at http://www.fda.gov/forconsumers/consumerupdates/ucm107836.htm.

[2] That is, the Pentothal or Nembutal purchased by MDOC before June 2012 had been manufactured under FDA-approved conditions.

still adhered to the classic triple drug lethal injection protocol. And of the 35 executions conducted in 2014, only 11 used a triple drug protocol.

21. Thus far, in 2015, of the 13 executions by lethal injection, 11 used single-drug barbiturate-only methods, and only 2 used the triple drug protocol with a paralytic agent and potassium chloride.

22. Thus, the dominant form of lethal injection in the United States has become an "anesthetic-only" procedure, in which prisoners are simply administered a lethal overdose of sedative-anesthetic drug.

23. Previously, state departments of corrections had expressed concerns that a barbiturate-only protocol could not efficiently accomplish the execution of a condemned prisoner. But in every single execution in which the "anesthetic-only" technique was used, the prisoner died without the need to administer other classes of drugs. There is thus no evidence to support the idea that lethal injection needs to include the use of a paralytic drug or potassium chloride. As with veterinary euthanasia, which decades ago eschewed and prohibited the use of paralytics and potassium, the goal of causing death has been demonstrated to be achievable in humans by anesthetic-only overdose. This is a matter of historic fact that has been demonstrated and established by the majority of currently-executing states and in the majority of executions.

24. The great majority of executions using the anesthetic-only technique use a single drug, either sodium thiopental or pentobarbital.[3] These drugs are both barbiturates, and in massive overdose they ablate consciousness, ablate respiration, and produce hemodynamic collapse.[4] The combination of not breathing and hemodynamic collapse causes rapid death. Because the prevention of breathing and the hemodynamic collapse only occurs with the successful administration of a high dose of barbiturate, and because the dose required for these effects is higher than the dose required to produce unconsciousness, any person who dies from respiratory cessation and hemodynamic collapse caused by barbiturates will necessarily have been unconscious and thus incapable of experiencing anything, including pain or suffering.

25. From the above, it should be clear that the single-drug anesthetic-only barbiturate technique has repeatedly achieved the states' goal of producing a rapid and painless death. As a matter of historical fact, multiple executions using the single-drug protocol with FDA-approved barbiturates have been conducted by multiple states without anomaly, incident, or complaint.

26. The success of the barbiturate-only protocol demonstrates conclusively that the inclusion of a paralytic drug and potassium chloride in a lethal injection protocol is unnecessary to achieve the governmental purpose of producing a rapid painless execution.

27. It is important to understand that the neuromuscular blocking agents proposed by the MDOC for use as the second drug (the “chemical paralytic agent” in the Mississippi statute) do not cause unconsciousness in the way that an anesthetic drug does. Rather, if administered alone or after an insufficient dose of anesthetic, a lethal dose of pancuronium bromide or vecuronium

[3] Two of the anesthetic-only executions used a combination of midazolam and hydromorphone. These prisoners died, but it took much longer than other executions. The use of midazolam is currently under review by the United States Supreme Court.

[4] Hemodynamic collapse is a steep decline in blood pressure and cardiac function.

bromide would cause a condemned inmate to lose consciousness *only after* he or she had endured the excruciating experience of suffocation. The paralytic agent would totally immobilize the inmate by paralyzing all voluntary muscles (including the diaphragm), causing the inmate to suffocate to death while experiencing an intense, conscious, and desperate desire to breath.

28. Ultimately, consciousness would be lost, but it would not be lost as an immediate and direct result of the pancuronium bromide or vecuronium bromide. Rather, the loss of consciousness would be due to suffocation, which would be preceded by the torment and agony caused by suffocation. This period of torturous suffocation would be expected to last at least several minutes and would only be relieved by the onset of suffocation-induced unconsciousness.

29. The experience, in onset and duration and character, would be very similar to that of being suffocated by having one's nose and mouth blocked off. However, there would be the additional element of being unable to move or writhe or communicate the agony.

30. There is no medical dispute that intravenous injection of concentrated potassium chloride solution, such as that administered by the MDOC as the third drug in its execution series, causes excruciating pain. The vessel walls of veins are richly supplied with sensory nerve fibers that are highly sensitive to potassium ions.

31. Thus, in comparison to the single-drug anesthetic-only barbiturate technique, the use of a paralytic drug and potassium chloride in a three-drug protocol presents a substantial risk of causing an agonizing, painful, and cruel death, while otherwise serving no legitimate purpose. Conscious paralysis is not simply a bad way to die, it is one of the worst ways to die. Chemical entombment and suffocation, combined with the excruciating pain caused by the injection of concentrated potassium chloride, is difficult to surpass in terms of agony.

32. It is important to note that the experience of a single-drug technique using FDA-approved barbiturate was not available to the United States Supreme Court when it ruled that the inclusion of a paralytic agent and potassium chloride, as practiced by Kentucky, was acceptable. Further, it is notable that despite the United States Supreme Court allowing Kentucky to use a paralytic agent and potassium chloride, Kentucky has since abandoned that technique in favor of an anesthetic-only method.

33. The botched execution of Clayton Lockett by Oklahoma in April 2014 provides further evidence as to the substantial risks associated with the three-drug protocol which are remedied by the use of a single-drug anesthetic-only protocol. Further this execution undermines the confidence of state departments of corrections that known and documented problems with the three-drug protocol can be eliminated with the use of procedural safeguards (such as a physician to insert the intravenous line).

34. The Lockett execution used a three-drug protocol with a paralytic agent and potassium chloride, and resulted in an excruciatingly agonizing death by chemical entombment and suffocation. The execution team, despite including a physician, was not able to competently insert a catheter into the lumen of a vein. After multiple failed attempts, the team inserted a catheter into Mr. Lockett's groin, but the catheter tip was not inside the femoral vein and the drugs infiltrated into the tissues surrounding the vein. The paralytic drug is rapidly absorbed into the circulation and gradually causes increasing weakness and ultimately suffocation via paralysis of

the respiratory muscles. By contrast, the anesthetic drug (in this case midazolam) takes much longer to enter the circulation and produce anesthetic concentrations in the blood and brain.

35. The Lockett execution clearly demonstrates the perils of the triple drug protocol. Even when a physician is present and personally inserts the IV catheter, if the catheter is misplaced then the prisoner will die a slow and agonizing death. The paralytic drug will produce its excruciating influence before the sedative/anesthetic produces unconsciousness. The execution of Angel Diaz in Florida in 2006 was botched in exactly the same way – specifically, all three drugs were infiltrated, and as expected from their known pharmacological behavior, the paralytic drug caused paralysis and suffocation before the anesthetic could render Mr. Diaz unconscious.

D. THE RISKS PRESENTED BY THE USE OF COMPOUNDED ANESTHETIC DRUGS IN EXECUTIONS

36. The second major change that has occurred over the past several years is that the availability of anesthetic drugs for executions from the drug manufacturers has been deeply restricted. State departments of corrections have changed the anesthetic used in their executions; some states have changed more than once. Many states have procured execution drugs that are not FDA-approved, but instead are compounded by a pharmacy from raw chemicals (referred to as Active Pharmaceutical Ingredient or "API").

37. Many states have concealed the identity of the compounding pharmacy that provides the execution drug, a step that prevents assessment of the quality of their raw ingredients or their compounding procedures.

38. It is important to note that while every single-drug execution performed using FDA-approved barbiturate (either sodium thiopental or pentobarbital) has resulted in death without any evidence of anomaly, pain, suffering, or complaint, the same does not hold for executions performed with non-FDA-approved compounded barbiturates.

39. Michael Wilson, executed by Oklahoma in 2014 using compounded barbiturate in a three-drug series, stated "I feel my whole body burning" as the compounded drug was injected and moved through his circulatory system. Barbiturate injection into a vein should not be palpable or painful, and should not produce a burning sensation. Mr. Wilson's statement is therefore consistent with a painful reaction to the injection of contaminated pentobarbital. The manufacturer, supplier, and compounder of this barbiturate remains unknown. And as Michael Wilson was paralyzed as part of the three-drug injection, it is not possible to know from the external observations of witnesses whether his death was humane or cruel.

40. Like Oklahoma at the time of the Wilson execution, Mississippi plans to use compounded pentobarbital as the first drug in a three-drug series, to be followed by the injection of a paralytic agent and potassium chloride. A sub-potent and/or contaminated barbiturate cannot be relied upon to render a prisoner fully anesthetized and insensate, posing the substantial risk of serious harm resulting upon the injection of the paralytic agent and potassium chloride.

41. Use of compounded pentobarbital in executions also poses the risk of degradation from substandard handling and storage of the API and/or compounded drug. The scheduled execution of Kelly Gissendaner in Georgia in March 2015 should caution against the use of

compounded pentobarbital where the protocol for the compounding, transportation, and storage of the drug is unknown and not subject to public scrutiny.

42. The scheduled execution of Ms. Gissendaner was postponed because the compounded pentobarbital solution was cloudy (definitive evidence of a major problem with the drug, rendering it unfit for use). The Georgia Department of Corrections has now cited to failures in the handling and storage of the compounded drug as the cause. Based on the information presently available, the Department not only failed to maintain a proper temperature during the transport and storage of the drug, but also failed to conduct any research as to the appropriate storage temperature and to develop a handling protocol accordingly. Further, because of the secrecy of the process of procuring compounded pentobarbital, it is not known which pharmacy produced Georgia's supply or which other states may have purchased raw ingredients or compounded drugs from the same source.

E. THE RISKS POSED BY THE CURRENT MISSISSIPPI PLAN

43. Turning now to the specifics of the current lethal injection situation in Mississippi, the developments described above need to be incorporated to understand the high risk of a botched and cruel execution.

44. First, the MDOC is currently proposing to use compounded pentobarbital (in the past it used Pentothal, an FDA-approved barbiturate, and then Nembutal, an FDA-approved preparation of pentobarbital). As described above, the use of compounded pentobarbital carries the risk of sub-potency, contamination, or degradation in transport and storage.

45. According to the March 10, 2014 affidavit of MDOC attorney Jim Norris and records from Professional Compounding Centers of America, Inc. (the original supplier of the pentobarbital sodium API), the batch of pentobarbital sodium API held by MDOC has an expiration date of May 20, 2015 – a month from now. It is important to understand that even a small level of contamination or small deviation in the preparation process will, over time, lead to increasing deterioration of the quality of the batch. Because the MDOC's batch of pentobarbital sodium API is at the brink of expiry, a small problem with the initial preparation may well have progressed, over time, into a severe problem that will cause an anomaly or botch. Any contamination, sub-potency, or super-potency in the original preparation may be enhanced as the batch ages closer to its expiration date.

46. Second, the documents disclosed by MDOC are devoid of any description as to how the pentobarbital sodium API will be compounded into a sterile injectable form. Formulating and compounding a sterile injection from API is a far more technical and complex process than the limited preparation the MDOC performed on the Pentothal and Nembutal it purchased in FDA-approved form.

47. Mississippi's protocol for lethal injection does not contemplate use of compounded pentobarbital. The protocol provides no guidance or instruction as to who will be responsible for compounding the pentobarbital sodium API into a sterile injection, where this compounding process is to take place, when the pentobarbital will be compounded in advance of an execution, and how the compounded drug will be transported and stored once it is prepared. MDOC has provided no other records that detail the protocol for compounding the pentobarbital sodium API,

and they have not disclosed the identity, qualifications, and experience of the personnel who will perform the compounding.

48. Indeed, based on the heavily redacted documents provided to counsel by MDOC, it appears that MDOC has never compounded this pentobarbital sodium API (or any other API) for use as the first drug in a lethal injection. It appears that the next execution in Mississippi will be the first to use the pentobarbital sodium API received by MDOC in June 2012.

49. Mississippi's use of compounded pentobarbital, near its expiration date, likely to be compounded by MDOC staff or the state executioner, and maintained under an unknown or nonexistent handling and storage protocol, as the sole bulwark to protect the prisoner from the agony of a paralytic drug and potassium chloride, presents more than a substantial risk of severe pain and serious harm. It is, rather, a foreseeable recipe for an egregious botch causing an agonizing death for the condemned prisoner.

50. In the *Berry* and *Thorson* cases in which I have given expert opinions, the MDOC expressed confidence that its personnel possess the requisite knowledge and experience to conduct lethal injection humanely. But in the face of the botched Lockett execution in Oklahoma, in which an actively-practicing physician supervised and participated in the procedure, there is no justification for such confidence. It is clear that, even when a physician carries out the procedure, the inclusion of a paralytic agent and potassium chloride in the protocol presents a substantial risk of hazard of a drawn-out agonizing death.

51. Moreover, given the Georgia experience with the planned execution of Kelly Gissendaner, there is reason for concern that MDOC's storage of the pentobarbital sodium API and/or the compounded injectable solution will cause degradation of the drug planned for use as the critical element to assure that the prisoner will not consciously experience the excruciating pain and agony caused by the use of the second and third drug in the Mississippi execution protocol.

52. For these reasons, it is my opinion, to a reasonable degree of medical certainty, that Mississippi's planned use of compounded pentobarbital as the first drug in a three-drug series which is completed with the continuous intravenous administration of a chemical paralytic agent and potassium chloride, creates a substantial risk of serious harm and severe pain to the condemned prisoner. The single-drug anesthetic-only barbiturate technique which is in use in other jurisdictions, using an FDA-approved ultra short-acting barbiturate, significantly reduces this substantial risk of severe pain.

F. COMPOUNDED PENTOBARBITAL IS NOT AN "ULTRA SHORT-ACTING BARBITURATE OR OTHER SIMILAR DRUG"

53. As stated above, Mississippi law requires that the anesthetic used as the first part of the execution process be "an ultra short-acting barbiturate or other similar drug." Sodium thiopental is classified among the ultra short-acting barbiturates. Pentobarbital, by contrast, is classified either as a short-acting barbiturate or an intermediate-acting barbiturate.

54. Barbiturates are classified both in terms of their speed of onset and their duration of action, but these properties are linked. Ultra short-acting barbiturates (referring to their duration of action) are also ultra fast-acting (referring to their speed of onset). By contrast, short-,

intermediate-, and long-acting barbiturates do not possess the quality of being ultra fast-acting, and their speed of onset is observably slower than an ultra fast-acting barbiturate.

55. While there is some flexibility as to the classification of barbiturates as short-, intermediate-, or long-acting, there is a sharp boundary between those barbiturates that are ultra fast- and ultra short-acting, and everything else. Barbiturates that are classified as short- or intermediate-acting (such as pentobarbital) have a slower speed of onset than an ultra short- or ultra fast-acting barbiturate (such as sodium thiopental), and thus do not achieve anesthetic depth in a patient as rapidly as an ultra short-acting barbiturate.

56. The significance of the term "ultra short-acting barbiturate" in the Mississippi statue is highlighted by the fact that the statute also requires a "continuous intravenous injection" of the execution drug. The instruction for this continuous application of the drug underscores the legislative intent that the barbiturate be ultra short-acting; there would be less need to employ a continuous injection for a barbiturate (such as a short-acting or an intermediate-acting barbiturate) with a longer duration of effect.

57. Documents disclosed by MDOC indicate that in four (4) of the last six (6) executions in Mississippi, the paralytic drug was "pushed" a mere two to three minutes after the anesthetic. By definition, an "ultra short-acting barbiturate" such as sodium thiopental takes effect much more quickly than does a "short- or intermediate-acting barbiturate" such as pentobarbital. Given the risks discussed above, the difference in the speed with which the two classes of drugs take effect is significant. Where the barbiturate used as the first drug in a three-drug protocol has a slower speed of onset, there is a substantial risk that the drug's anesthetic properties will not have taken effect when the paralytic agent and potassium chloride are injected.

58. This difference is magnified when, as planned by MDOC, compounded, rather than FDA-approved, pentobarbital is employed. Given the substantial risk that compounded pentobarbital could be contaminated, sub-potent, or even counterfeit, the MDOC ought to be concerned that the first drug it plans to use in its next execution is not an "ultra short-acting barbiturate or other similar drug."

59. For these reasons, it is my opinion, to a reasonable degree of medical certainty, that a drug compounded from pentobarbital sodium API is not an "ultra short-acting barbiturate or other similar drug" as described in Mississippi Code Section 99-19-51.

G. DECLARATION

I reserve the right to amend or update any of the above opinions if the advent of additional information so warrants.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

This, the 4th day of May, 2015.

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Mark J.S. Heath, M.D.